Wanyu Bian

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SUMMARY

Senior Machine Learning Engineer with 7+ years of applied research experience in generative AI, mathematical optimization, and large-scale model development. Published 10+ first-author papers and contributed to multiple patents spanning foundation modeling, diffusion models, meta-learning, and vision–language systems. Expert in bridging deep theoretical understanding with scalable engineering and responsible AI deployment for high-impact, safety-critical domains such as medical imaging and diagnostic automation.

Core Expertise:

Generative AI ○ Diffusion & Transformer Models ○ Vision–Language Modeling ○ Optimization Algorithms ○ Mathematical Modeling

EDUCATION

University of Florida — **Gainesville, FL**
Ph.D. in Applied Mathematics, advisor: Yunmei Chen — *08/2017 - 08/2022*

University of Florida — **Gainesville, FL**
M.S. in Applied Mathematics, advisor: Yunmei Chen — *08/2017 - 05/2019*

University of Missouri — **Columbia, MO**
B.S. in Applied Mathematics & B.S. in Statistics — *08/2013 - 05/2017*

WORK EXPERIENCE

Senior Machine Learning Engineer | Apple — *12/2025 - present*

- Focused on personalized search systems and vision-language model development for large-scale, user-facing products.

Senior Machine Learning Scientist | Neuro42 — *10/2023 - 12/2025*

- Designed and deployed **generative and self-supervised AI systems** for MRI reconstruction, segmentation, and diagnostic report generation.
- Developed **domain-conditioned diffusion and Transformer-based models**, improving reconstruction PSNR by > 2 dB and text-generation BLEU score to 0.82.
- Built end-to-end **PyTorch pipelines for multi-GPU training and inference** on AWS; reduced latency by 40% through model optimization and quantization.
- Led integrity and safety evaluations, establishing bias-mitigation and uncertainty-estimation protocols for diagnostic AI systems.

Research Fellow | Harvard Medical School — *05/2022 - 10/2023*

- Pioneered **multi-modality meta-learning frameworks** for joint MRI reconstruction and synthesis. Developed vision transformer–based motion-tracking models achieving $> 86\%$ processing-time reduction and improved clinical image fidelity.
- Proposed diffusion modeling with native-domain conditioning, integrating physical priors as embeddings for stable convergence.
- Collaborated with clinicians to validate system reliability and interpretability under safety-critical constraints.

Graduate Assistant | Department of Math, University of Florida — *08/2017 - 05/2022*

- Conducted research on optimization-based meta-learning and ensemble multi-task frameworks for solving inverse problems.
- Taught and mentored undergraduate/graduate courses in Numerical Linear Algebra, Numerical Analysis, and Calculus, emphasizing reproducible scientific computing.
- Published 5+ first-author papers on optimization and MRI reconstruction, integrating mathematical theory with data-driven design.

TECHNICAL SKILLS & LANGUAGES

- Programming: Python, Matlab, R, SAS, SQL
- Frameworks: PyTorch, TensorFlow, Keras, Hugging Face, Diffusers, Scikit-learn
- Engineering: CUDA, Docker, Git, AWS EC2/S3, Linux, CI/CD, Data Pipelines
- Model Types: Transformers, Diffusion Models, Meta-Learning, Self-Supervised Learning, Ensemble Models
- Research Tools: Mathematical Modeling, Variational Optimization, Inverse Problems, Statistical Learning

PUBLICATIONS

1. F. Liu, L. Zhang, **W. Bian**, X. He, "Chapter 29 Emerging AI Technology in MRI: Reconstruction, ImageProcessing, Analysis, and Beyond," *Clinical MR Physics: State-of-the-Art Practice, AAPM Monograph No.42 ISBN: 9781951134358* [link]
2. **W. Bian**, A. Jang, F. Liu, "**Multi-task** Magnetic Resonance Imaging Reconstruction using Meta-learning," *Magnetic Resonance Imaging, 116 (2025): 110278.* [link]
3. **W. Bian**, A. Jang, L. Zhang, X. Yang, Z. Stewart, F. Liu, "**Diffusion Modeling** with Domain-conditioned Prior Guidance for Accelerated MRI and qMRI Reconstruction," *IEEE Transactions on Medical Imaging, Aug 2024.* [link]
4. **W. Bian**, Y. K. Tamilselvam, "A Review of Optimization-Based Deep Learning Models for MRI Reconstruction," *Applied Math, 4.3 (2024): 1098-1127.* [link]
5. **W. Bian** et al., "A Review of Electromagnetic Elimination Methods for Low-field Portable MRI Scanner," *IEEE ICMLCA2024.* [link]
6. **W. Bian**, "A Brief Overview of Optimization-Based Algorithms for MRI Reconstruction Using Deep Learning," *Preprint, June 2024.* [link]

7. **W. Bian**, A. Jang, F. Liu, "Accelerating Quantitative MRI using **Self-supervised** Deep Learning with Model Reinforcement," *Proceedings of the 32nd Annual Meeting of ISMRM, May 2024.* (**Oral presentation**) [link]
8. **W. Bian**, A. Jang, F. Liu, "qDiMo: Domain-conditioned Diffusion Modeling for Accelerated qMRI Reconstruction," *Proceedings of the 32nd Annual Meeting of ISMRM, May 2024.* (**Oral presentation**) [link]
9. **W. Bian**, A. Jang, F. Liu, "Improving Quantitative MRI Using Self-supervised Deep Learning with Model Reinforcement: Demonstration for Rapid T1 Mapping," *Magnetic Resonance in Medicine, Feb 2024.* [link]
10. **W. Bian**, A. Jang, F. Liu, "Magnetic Resonance Parameter Mapping Using Self-supervised Deep Learning with Model Reinforcement," *Preprint, July 2023.* [link]
11. **W. Bian**, "Optimization-Based Deep Learning Methods for Magnetic Resonance Imaging Reconstruction and Synthesis," *Department of Mathematics, University of Florida, May 2022.* [link]
12. **W. Bian**, Q. Zhang, X. Ye, Y. Chen, "A Learnable Variational Model for Joint Multi-modal MRI Reconstruction and Synthesis," ***Provisional Acceptance*** *by MICCAI 2022.* [link]
13. **W. Bian**, Y. Chen, X. Ye, "An **Optimal Control** Framework for Joint-channel Parallel MRI Reconstruction Without Coil Sensitivities," *Magnetic Resonance Imaging, Volume 89, 2022, Pages 1-11.* [link]
14. **W. Bian**, Y. Chen, X. Ye, Q. Zhang, "An Optimization-Based **Meta-Learning** Model for MRI Reconstruction with Diverse Dataset," *Journal of Imaging 7, no. 11: 231, 2021.* [link]
15. **W. Bian**, Y. Chen, X. Ye, "Deep Parallel MRI Reconstruction Network Without Coil Sensitivities," *The 3rd International Workshop on Machine Learning for Medical Image Reconstruction (MICCAI-MLMIR'20), 2020.* (**Oral presentation, Student Participation Award**) [link]

Patents

- **Machine Learning System For Generating Context-Aware Expressive Animations With Emotional Intelligence** | Application # 19/242,890 | Filed: Jun 2025. | **Role: Inventor**
- **Vision-Language Artificial Intelligence System for Automated Medical Diagnostic Indication with Multimodal Knowledge Integration** | Application # 19/240,016 | Filed: Jun 2025. | **Role: Inventor**
- **Methods and Systems for Ultra-Lowfield Magnetic Resonance Image Denoising Using Self-Supervised Learning**
  neuro42,Inc. | Application # 63/741,377 | Filed: Nov 2024. | **Role: Lead Inventor**
- **Methods and Systems for Optimizing Magnet Array Configurations**
  neuro42,Inc. | Application # 63/740,816 | Filed: Nov 2024. | **Role: Lead Inventor**
- **Methods For Noise Reduction On Measurement Domain**
  neuro42,Inc. | Application # 63/750,253 | Filed: Nov 2024. | **Role: Lead Inventor**
- **Methods and Systems for Correction of Asymmetric Noise Pattern in Low-Field MRI**
  neuro42,Inc. | Application # 63/741,764 | Filed: Nov 2024. | Role: Contributing Inventor

TALKS & PRESENTATONS

- qDiMo: Domain-conditioned Diffusion Modeling for Accelerated qMRI Reconstruction, at ISMRM 2024, May 2024. (**Oral presentation**) [link]
- Accelerating Quantitative MRI using Self-supervised Deep Learning with Model Reinforcement, at ISMRM 2024, May 2024. (**Oral presentation**)[link]
- Accelerated qMRI for Tissue Quantification using Generative AI and Diffusion Modeling, at Harvard Medical School, Oct 2023. (**Oral presentation**) [link]
- A learnable variational model for joint multimodal mri reconstruction and synthesis, at MICCAI 22, Sep 2022.
- An Optimization-Based Meta-Learning Model for MRI Reconstruction with Diverse Dataset, at SIAM Conference on Imaging Science (IS22), held virtually, March 2022.
- Learnable Optimization Algorithm for MRI Reconstruction with Meta-learning Model, at University of Florida Chapter of SIAM (SIAM Gators), held virtually, Oct 2021.
- Deep Parallel MRI Reconstruction Network Without Coil Sensitivities, at MICCAI-MLMIR'20, held virtually, Oct 8 2020. (**MICCAI Student Participation Award**)
- Deep Neural Network for Parallel MRI Reconstruction Without Coil Sensitivity Maps, at SIAM Conference on Imaging Science (IS20), held virtually, July 16 2020. (**SIAM Student Travel Award**)

AWARDS & LEADERSHIP

- **MICCAI 2022 NIH PARTICIPATION AWARDS**, MICCAI 2022 — *Sep 2022*
- **President** of Graduate Student Chapter of the AMS at University of Florida — *Jan 2020 - May 2022*
- **Research Chair** of Association for Women in Mathematics for UF Chapter — *Sep 2019 - May 2022*
- **MICCAI Student Participation Award**, MICCAI 2020 — *Oct 2020*
- **SIAM Student Travel Award** to attend the 2020 SIAM Conference on Imaging Science — *July 2020*
- **Winner of Best in show**, DataFest 2017 — *April 2017*
- **Scholarship in College of Art & Science**, University of Missouri — *Fall 2015 and Spring 2016*

PROJECT HIGHLIGHTS

Vision–Language Diagnostic Indication Generation (Neuro42 2024 – Present) [link]| **neuro42** — *12/2024 - current*

- Developed a vision-language model diagnostic system for brain MRI analysis, leveraging **Vision Transformer** (ViT) and **Transformer Decoder models** to automatically generate clinical indications from MRI scans.
- BLEU score=0.82. This measures similarity between generated indications and radiologist reports (higher is better, max = 1.0).

Self-supervised learning model for image contrast enhancement [link]| **neuro42** *05/2024 - 08/2024*

- Improved gray/white matter separation visibility by > 20% contrast ratio.

Self-supervised learning model for noise suppression [link] | **neuro42** *11/2023 - 12/2023*

- Self-supervised denoising achieved +11 dB SNR gain with robust generalization to low-field devices.
- SNR improved 11 dB in average and comparable to the data from high field scanner.

Diffusion model for image reconstruction [link]| **Harvard Medical School** *06/2023 - 10/2023*

- Developed **diffusion model** that conditioned on native data domain. The prior physics information are used as embeddings in the diffusion model. Reconstructed PSNR improved 2 dB comparing to state-of-the-art.

Multi-Task Meta-Learning Reconstruction [link]| **University of Florida** *10/2021 - 5/2022*

- Unified reconstruction across multi-contrast MRI; reduced scan time 86% while preserving tissue fidelity.

Multi-task MRI Reconstruction using Meta-learning| Harvard Medical School *12/2022 - 03/2023*

- Conducted **multi-task learning** for reconstructing multiple sequences of images scanned in different contrasts using **Meta-Learning**.
- Implemented a multi-task learning model, achieving a reduction in processing time by 86%. The model removes aliasing artifacts and preserve tissue details compared to individual training with highly under-sampling ratio (only 1/6 of signal was scanned).

Professional Service

- **Journal/Conference Reviewer** for AAAI-26, ICML 2025, ICLR 2025, NeurIPS 2024&2025, MICCAI 2024, IEEE Transactions on Medical Imaging, Journal of Digital Imaging, Journal of Imaging Informatics in Medicine, MDPI AppliedMath and MDPI Mathematics.